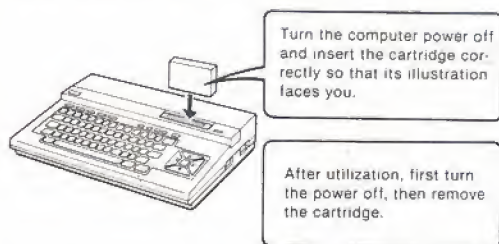# HBM-64

SERVICE MANUAL

Before utilizing the cartridge, please read this instructions thoroughly.

The HBM-64 64K byte RAM cartridge is used to expand the memory area of an MSX computer.

CARTRIDGE INSERTION

Turn the computer power off and insert the cartridge correctly so that its illustration faces you.

After utilization, first turn the power off, then remove the cartridge.

ADDRESS ASSIGNMENT FOR RAM AREA TO BE EXPANDED

The HBM-64 64K byte RAM is assigned to memory addresses from 0000H to FFFFH.

Notes

● When an MSX personal computer has 64K bytes of RAM, the BASIC user area or MSX-DOS program area cannot be expanded with the HBM-64.
● When an MSX personal computer has 32K bytes of RAM, the BASIC user area cannot be expanded but the MSX-DOS program can be used.
● Utilize the HBM-64 with software that controls the switching of the computer RAM and the HBM-64.

PRECAUTIONS

Power supply
Always turn the computer power supply off when inserting or removing a cartridge.

Cartridge handling
● Do not spill liquid on a cartridge, or do not insert or stick your fingers in the cartridge space.
● Do not cause an impact to a cartridge such as dropping or hitting it against something.
● Do not disassemble a cartridge.

Storage locations
Do not store a cartridge in the following places.
• A place with direct sunshine.
• Near a heater.
• A place with high humidity.
• Inside a car with the windows closed (especially in the summer time) since the temperature sometimes exceeds 100°C depending on the season which causes trouble or warps it.
• A dusty place.

EXPANSION MEMORY CARTRIDGE

SONY®

SERVICE INFORMATION

Using HBM-64 Check ROM

1. Setup

(1) Connect the HB-55P to the monitor and printer.

(2) Remove the upper cabinet of the HB-55P.

(3) Remove the firmware IC (IC44) from the main board of HB-55P.

(4) When the firmware IC uses a mask ROM, connect an EPROM jumper (JW6) to the board.

(5) Mount the check ROM (J-6206-100-A).

2. Test

(1) Insert the testing HBM-64 in the MSX slot of the HB-55P.

(2) Power on the HB-55P, monitor, and printer.

(3) The following menu is displayed on the monitor:

```
*******************************

HBM-64  CHECK PROGRAM  Ver 1.0

*******************************

           PRINTER OFF

         Wait time = 05sec

      Max Pass count = ENDLESS




Select slot number  (1~3)   ?
```

a) When the P key on keyboard is pressed, the printer is turned on. To output the monitor display onto the printer, turn the printer on.

Note:

If the P key is pressed with no printer connected, the ckeck operation does not occur.

b) Set the wait time by operating the cursor key UP/DOWN. The shorter the wait time, the sooner will the check operation be completed.

c) Set the maximum pass count by operating the cursor key LEFT/RIGHT. This operation determines how many times the test is to be performed.

d) Set the select slot number by a numeric key.
Cartridge slot A . . . . . Set to 1.
Cartridge slot B . . . . . Set to 3.

(4) When the slot number is specified, the check operation gets started. The data is output to both monitor and printer at the same time.

(5) When the following is displayed on the monitor, it indicates the termination of the check operation:

```
HBM-64 Memory check start !!
        .....  Check slot  1

Pass 0001 Start !
     Total error 0000


*****     HBM - 64 CHECK  END    *****

       Total error 0000
```

(6) If a data error is encountered in a check operation, the affected address and data are displayed. Correct the failing location accordingly.

(7) The following is the display to be given if slot 3 is selected while the HBM-64 is inserted in slot A:

```
HBM-64 Memory check start !!
        .....  Check slot  3

Pass 0001 Start !
MEMORY ERROR !!        error count 0001
at 0000H   DATA 10101010 -> 11111111
MEMORY ERROR !!        error count 0002
at 0001H   DATA 10101010 -> 11111111
MEMORY ERROR !!        error count 0003
at 0002H   DATA 10101010 -> 11111111
MEMORY ERROR !!        error count 0004
at 0003H   DATA 10101010 -> 11111111
MEMORY ERROR !!        error count 0005
at 0004H   DATA 10101010 -> 11111111
                   .
                   .
                   .
```
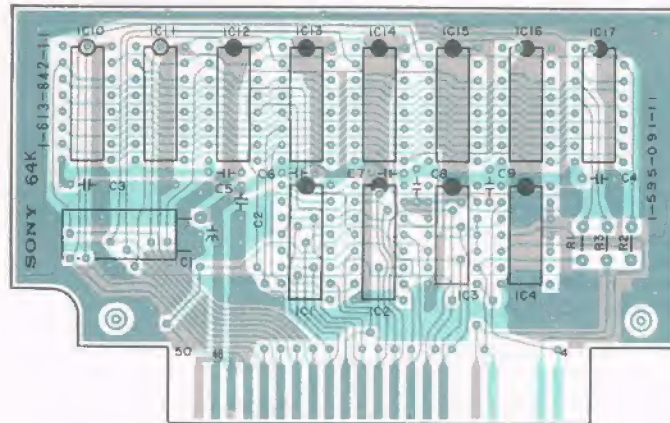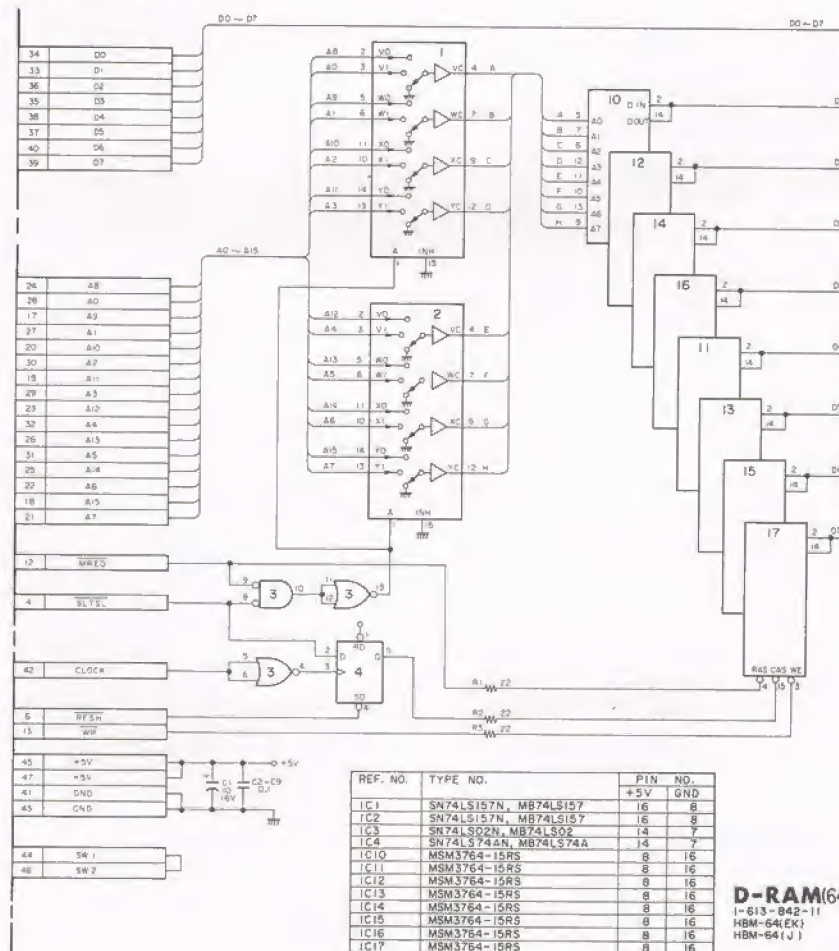
Continued

3. Termination

(1) When the test has been completed, remove the EPROM jumper (JW6) from the board.

(2) Remove the check ROM and connect the firmware IC.

PRINTED CIRCUIT BOARD

D-RAM
COMPONENT SIDE
1-613-842-11
HBM-64(EK)
HBM-64(J)

SCHEMATIC DIAGRAM

REF. NO.	TYPE NO.	PIN NO. +5V	GND
IC1	SN74LS157N, MB74LS157	16	8
IC2	SN74LS157N, MB74LS157	16	8
IC3	SN74LS02N, MB74LS02	14	7
IC4	SN74LS74AN, MB74LS74A	14	7
IC10	MSM3764-15RS	8	16
IC11	MSM3764-15RS	8	16
IC12	MSM3764-15RS	8	16
IC13	MSM3764-15RS	8	16
IC14	MSM3764-15RS	8	16
IC15	MSM3764-15RS	8	16
IC16	MSM3764-15RS	8	16
IC17	MSM3764-15RS	8	16

D-RAM(64K)
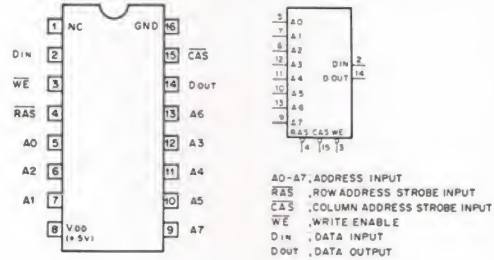1-613-842-11
HBM-64(EK)
HBM-64(J)

SEMICONDUCTOR PIN ASSIGNMENTS

HD74LS02P (HITACHI)
MB74LS02 (FUJITSU)
SN74LS02N (TI)
TTL 2-INPUT POSITIVE-NOR GATE
— TOP VIEW —

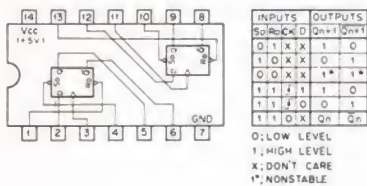$Y = \overline{A + B} = \overline{A} \cdot \overline{B}$

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

0 : LOW LEVEL
1 : HIGH LEVEL
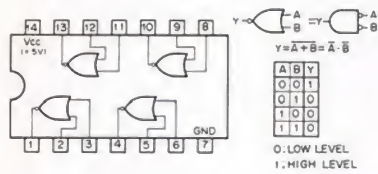
MSM3764-15RS (OKI) (ACCESS TIME = 150 nS)
N-MOS 65,536-WORD BY 1-BIT DYNAMIC RAM
— TOP VIEW —

1	NC	GND	16
2	DIN		15	$\overline{CAS}$
3	$\overline{WE}$		14	Dout
4	$\overline{RAS}$		13	A6
5	A0		12	A3
6	A2		11	A4
7	A1		10	A5
8	VDD (+5V)		9	A7

A0-A7, ADDRESS INPUT
$\overline{RAS}$, ROW ADDRESS STROBE INPUT
$\overline{CAS}$, COLUMN ADDRESS STROBE INPUT
$\overline{WE}$, WRITE ENABLE
Din , DATA INPUT
Dout , DATA OUTPUT

HD74LS157P (HITACHI)
MB74LS157 (FUJITSU)
SN74LS157N (TI)
TTL 2-LINE-TO-1-LINE DATA SELECTOR/MULTIPLEXER
— TOP VIEW —

| CONT. IN		ON
INH	A	CHANNEL
0	0	0
0	1	1
1	X	GND

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
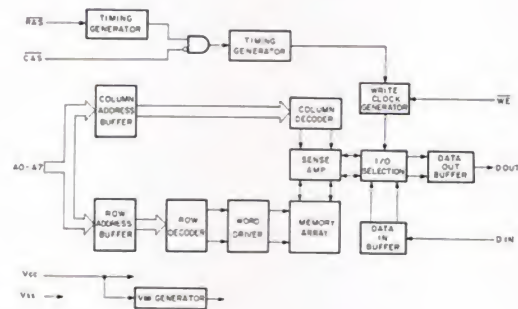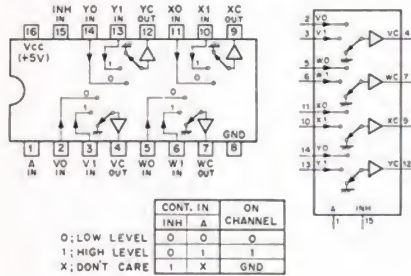
HD74LS74AP (HITACHI)
MB74LS74A (FUJITSU)
SN74LS74AN (TI)
TTL D-TYPE FLIP FLOP WITH DIRECT SET/RESET
— TOP VIEW —

INPUTS				OUTPUTS	
So	Ro	Ck	D	Qn+1	$\overline{Qn+1}$
0	1	X	X	1	0
1	0	X	X	0	1
0	0	X	X	1*	1*
1	1	↑	1	1	0
1	1	↑	0	0	1
1	1	0	X	Qn	$\overline{Qn}$

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE
1* ; NONSTABLE

EXPLODED VIEW

No.	Parts No.	Description
1	A-8000-215-A	**CARTRIDGE ASSY, MSX**
2	3-701-690-01	**LABEL (MADE IN JAPAN)**
3	4-605-201-01	**LABEL (64KB)**
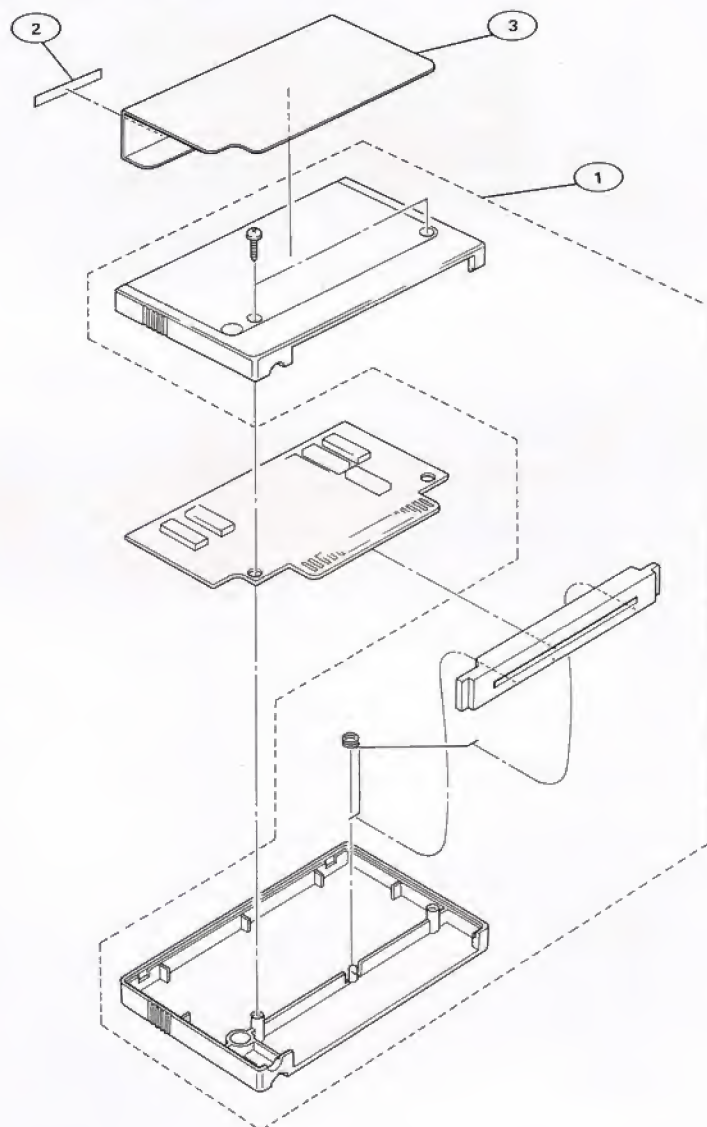
NOTE:

1. Parts printed in Bold-Face type are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.

2. Item with no part number and/or no description are not stocked because they are seldom required for routine service.

ELECTRICAL PARTS LIST

Ref. No.	Parts No.	Description
D-RAM BOARD		
C1	1-123-356-00	ELECT 10 20% 50V
C2	1-162-179-11	CERAMIC 0.1 50V
C3	1-162-179-11	CERAMIC 0.1 50V
C4	1-162-179-11	CERAMIC 0.1 50V
C5	1-162-179-11	CERAMIC 0.1 50V
C6	1-162-179-11	CERAMIC 0.1 50V
C7	1-162-179-11	CERAMIC 0.1 50V
C8	1-162-179-11	CERAMIC 0.1 50V
C9	1-162-179-11	CERAMIC 0.1 50V
IC1	8-759-901-57	SN74LS157N
IC2	8-759-901-57	SN74LS157N
IC3	8-759-900-02	SN74LS02N
IC4	8-759-900-74	SN74LS74AN
IC10	8-759-905-75	MSM3764-15RS
IC11	8-759-905-75	MSM3764-15RS
IC12	8-759-905-75	MSM3764-15RS
IC13	8-759-905-75	MSM3764-15RS
IC14	8-759-905-75	MSM3764-15RS
IC15	8-759-905-75	MSM3764-15RS
IC16	8-759-905-75	MSM3764-15RS
IC17	8-759-905-75	MSM3764-15RS
R1	1-247-791-00	CARBON 22 5% 1/6W
R2	1-247-791-00	CARBON 22 5% 1/6W
R3	1-247-791-00	CARBON 22 5% 1/6W

PACKING MATERIAL

Ref. No.	Parts No.	Description
	3-773-921-11	MANUAL, INSTRUCTION
	4-604-478-01	INDIVIDUAL CARTON (INNER BOX)
	4-605-202-01	INDIVIDUAL CARTON (OUTER BOX)

FIXTURE (OPTIONAL)

Ref. No.	Parts No.	Description
	J-6206-100-A	CHECK ROM

NOTE:

1. The shaded and ⚠-marked components are critical to safety.
   Replace only with same components as specified.

2. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this manual are not normally required for routine service work. Orders for parts not shown in Bold-Face type will be processed, but allow for additional delivery time.